

defects from the literary point of view, the book is to be welcomed as an addition to the scanty literature of glass from the pen of a practical glass worker, and it will no doubt find many appreciative readers among those interested in decorative glass. W. R.

#### ASTRONOMY, MYTH, AND LEGEND.

*The Judgment of Paris, and some other Legends Astronomically Considered.* By the Hon. Emmeline M. Plunket. Pp. iv+199; illustrated. (London: J. Murray, 1908.) Price 7s. 6d. net.

NO archaeologist denies that in the "myth-making age" (whenever that may have been; we are still making myths now) our primitive ancestors were often struck with the appearance of the heavenly bodies, and made pretty stories out of them. But what he does deny is that, at any rate in the case of Greece, the majority of the myths, or anything like the majority, are of celestial origin. We know, also, far too much about the probable early history of the Ægean countries to believe for a moment that many Greek legends (as distinct from myths) are connected with the movements of the sun, moon, and stars. But the Hon. Miss Plunket finds an astronomical explanation for all legends as well as myths. She confuses the two; for her Achilles or Agamemnon are as unreal as Aphrodite and Hera, and all four are but symbols, so to speak, of some aspect of the heavenly bodies at some time or other.

To the Greeks Aphrodite and Hera were as real as Achilles or Agamemnon. Miss Plunket reverses the process. Both she and the Greeks are equally uncritical in their method! For her everything is unreal and astronomical. But why should not some of the myths, and a few of the legends, be astronomical, and the rest not? After all, we are not all of us star-gazing now, and there is no proof that our "myth-making" ancestors were more given to the pursuit than we are. An archaeological discovery has shown us that many of these astronomical explanations of legend are mere fantasy, as we fear much of Miss Plunket's book is. There is far more earthly reality about these stories than she thinks. The murder of Agamemnon by Klytëmnestira and Aigisthos, in which Miss Plunket sees "mythically chronicled an eclipse occurring at or close to the season of the winter solstice," would be considered by the modern archaeological historian to be a legendary reminiscence of a real tragedy of a particularly ghastly character perpetrated in the royal burg of Mycenæ at some time during the period of Achaian domination, no more. Why should it be anything else? Why be astronomical? Why should the Greeks have woven all these cryptic legends about stars?

To regard the Trojan war, too, as an astronomical myth after the discoveries of Schliemann is to exhibit a peculiar point of view. Miss Plunket calls it a "conviction." "Convictions" are unscientific; they are merely inverted prejudices, and no scientific worker has any business to be dominated by them. We note, however, from many indications, that Miss Plunket would be scientific enough could she but

conceive the possibility that every myth and legend is not necessarily of astronomical origin. With her suggestion that the Gorgon's head is originally the cold full moon we are in cordial agreement. We have then in the Perseus story a queer folk-tale of a sort of Jack-the-Giant-Killer who went up into the sky and brought the moon down, as the primitive mind, like the child-mind now, could easily conceive the wonderful person as doing. In this there is nothing astronomical; and the Medusa on the shield of Athene may very well be the full moon on the body of the goddess of the grey-blue night-sky, γλαυκῶπις Ἀθήνη; why not? But there is no astronomical complication here, only a general sky-goddess with the moon on her, as it naturally would be. Miss Plunket's explanation of the term Τριτογένεια for Athene as "born of Trita," a deity of the Avesta, is at least more probable than the very doubtful connection with Lake Tritonis in Libya. The author makes other suggestions which will compel the most sceptical critic to read her work with attention and respect, even though he may differ *toto caelo* from its main contentions.

H. R. HALL.

#### HEAT FOR ENGINEERS.

*Heat for Engineers. A Treatise on Heat, with Special Regard to its Practical Applications.* By Chas. R. Darling. Pp. xii+430. (London: E. and F. Spon, Ltd., 1908.) Price 12s. 6d. net.

ANY author who attempts to cover the syllabus outlined in the preface and contents of this treatise needs considerably more than 415 pages of the ordinary-size text-book in which to do that properly. Too much has been attempted, and a great opportunity has not been made use of to the fullest advantage. Some portions of the book are elementary to a degree which irritates; other portions are so advanced that needful and useful sections have been sacrificed in order to keep the size of the book within the usual limits. Clearly the author should have divided his matter into two volumes, one elementary and the other advanced. In the preface there is rightly expressed the opinion that "the numerous applications of heat in modern industrial processes" . . . do not "receive more than the briefest mention in ordinary treatises on heat," and it is the avowed object of this book to remedy that omission. Yet "Practical Heat Engines" are disposed of in sixteen pages, and one searches in vain for a mention of that most interesting and instructive heat motor—the Diesel engine. There is nothing about evaporators; a study of the action of multiple-effect evaporators especially conveys much that is useful to the engineering student. We obtain the impression that the book is meant for the student in physics, and not for the engineer. If that is conceded, then there is more reason for its contents. In any case, however, space might have been found for dealing with the errors of the aneroid barometer, since the instrument itself is considered and described. An improvement in the arrangement of the contents

could be made with advantage. For example, pp. 119 to 136 contain some excellent matter on pyrometers. It is advanced work. From pp. 276 to 358 we are made to wade through much that is quite elementary on conduction, convection, and radiation!

There can be no question about the merits of two important sections of the book, viz. the chapter on calorimetry and that on pyrometry. Here the author is clearly doing work which pleases him, work with which he is both theoretically and practically well acquainted, and work which is done in a manner worthy of all praise. We can recommend our engineering students and our practical engineers to obtain the book for the contents of these two chapters. Great care has been expended throughout in the preparation of the text, and although a few of the illustrations might have been improved upon, yet they are, taken on the whole, good.

As we have suggested above, the title is misleading. The engineer will expect to be able to do without any other text-book on the theory of heat engines. He will, however, require some other manual, and he will find, in consequence, much overlapping. It must be made quite clear that the contents of "Heat for Engineers" is well written. The author has evidently devoted much labour and thought to the preparation of the book. Considered individually, each chapter is excellent. The above suggestions have been made in no carping spirit, but in the earnest hope that engineers will obtain fuller benefits in the shape of a more practical text-book from one who clearly is capable of helping them to understand difficult problems.

C. A. SMITH.

### HIGHWAY ENGINEERING.

*Highway Engineering.* By Chas. E. Morrison. Pp. v+315. (New York: J. Wiley and Sons; London: Chapman and Hall, Ltd., 1908.) Price 10s. 6d. net.

*A Text-book on Roads and Pavements.* By F. P. Spalding. Third edition, revised and enlarged. Pp. x+340. (Same publisher.) Price 8s. 6d. net.

THE first-named of these treatises on highways was prepared by the author, who is professor of civil engineering at Columbia University, for the students there, "with a view to furnish a text in which the fundamentals of the subject should not be buried in a mass of detail," and the endeavour has been "to outline and emphasise the basic principles which are essential to good highways."

The book is divided into ten chapters, dealing respectively with road resistance; roads made of earth, gravel, broken stone and other materials; the design of streets, and paving with stone, bricks, asphalt, and wood. It contains a great deal of useful information, especially to engineers having to deal with roads in new countries. The elementary principles of road-making are clearly set out, and copies of specifications suitable for different classes of roads are given. The illustrations are numerous and clear, and in some cases graphic, as, for example, the relative load that can be drawn with the same tractive force on different

kinds of road is shown by the number of horses required to draw the same load, this number varying from half a horse on a first-class road to ten on an earthen track.

With regard to the repairs of macadamised roads in rural districts, the author emphasises the fact, recognised by all experienced road engineers, that

"the best results are obtained at a less cost by a system of continuous small repairs, and that to keep a road in an efficient manner, incessant vigilance is required, any signs of ruts or hollows being at once filled up."

As to trees by the side of roads, the author points out that, whatever may be the disadvantages of roadside trees, it has been the practice in the most progressive road-building countries to plant trees by the roadsides. In France all roads having a width of 33 feet or over have a single row on each side, generally at distances varying from 16 to 32 feet apart. In some countries in the rural districts fruit trees are planted for which the road authority derives a revenue by the sale of the privilege to gather the fruit.

It may also be here mentioned that at the recent road conference at Paris it was agreed that, with a view to dust prevention, the planting of trees along the sides of the roads should be encouraged.

The effect of motor traffic on the surface of roads, and the great dust question, which at the present time are receiving so much attention both by the users and the road authorities, occupy only a small space in this book. The oiled roads that are in use in some districts in the United States are, however, more fully dealt with. With the object of preserving the surface of the road and preventing dust in dry weather, oiled roads are in operation over several hundreds of miles in California and other States. The cross-section of roads subjected to this process is graded to an inclination of half an inch to a foot. Before being treated with the oil the surface is sprinkled with water, then rolled with a light roller, after which a harrow having three-inch teeth is drawn over the surface. The oil is then spread from a specially designed tank cart at a rate varying from 8500 to 18,800 gallons to a mile of road 16 feet in width, or, say, from one to two gallons per square yard. Oils having an asphalt base are best suited for the purpose, but all petroleum are used. The surface of a road treated in this way is fit for the traffic twenty-four hours after being dressed, and is found to be impervious to rain-water, the surface remaining hard and firm also in hot weather.

The use of bricks for road paving, so frequently met with in Holland, has been introduced into America, especially in the smaller towns, the popularity of this form of paving being indicated by the fact that in a period of ten years, out of all the hard paving material used, 33 per cent. was of brick, 43 per cent. of asphalt, 10 per cent. of granite, and 9 per cent. of wood. The advantages claimed for bricks as a paving material are: a good foothold for the horses, efficient traction, durability under moderate